Revolution in Joint Terminal Attack Control Training

Ground-based training for Joint Terminal Attack Control (JTAC) operators will never be the same thanks to a revolutionary blend of government-off-the-shelf (GOTS) and commercial-off-the-shelf equipment known as the JTAC Virtual Trainer (VT). The Joint Close Air Support (JCAS) research and development (R&D) team of scientists, engineers, and subject-matter experts (SME) collaborated with sister-Service and industry partners to showcase the JTAC Training and Rehearsal System (TRS) VT Dome and Instructor Operating Station (IOS) at AFRL Mesa.

Using a holistic approach, the JCAS R&D team is guided by the Joint Requirements Oversight Council-approved Joint Operational Requirement. Document and Mission Essential Competency (MEC) survey analysis by JTAC SMEs. The team partnered with Air Support Operations Center (ASOC), Direct Air Support Center (DASC), Special Tactics Squadron (STS), and Tactical Air Control Party (TACP) SMEs from all Services to endorse training and system requirements.

As a proof-of-concept, the first JTAC TRS Dome and IOS are ready to support mission training, rehearsal, and performance assessment for JTAC teams in the Live, Virtual, and Constructive (LVC) environment of Distributed Mission Operations (DMO).

Armed with DMO capability, the JTAC TRS will augment training with MEC-based scenarios designed to ingrain high-order competencies in pre-mission planning, mission planning and coordination, effects-based targeting and weapons evaluation, attack control, and mission assessment.

While orchestrating violence, the JTAC follows Rules of Engagement designed to ensure associated risks are minimized while executing JCAS missions. The JTAC TRS enables realtime visual and electronic interaction in a synthetic hostile environment with SME supervision via the IOS.

Subsequently, MEC-based scenarios will increase JTAC proficiencies by “raising the training bar” for all skill levels at much lower costs and much higher realism than using increasingly sparse live combat air assets on ranges with constricted weapons release limitations.

Although lacking a Systems Program Office (SPO), the JTAC TRS is part of the FY2008-2012 Program Objective Memorandum funding for Air Support Operations Squadron (ASOS) and STS mission needs. The JTAC TRS program is a four-spiral R&D effort, with the JTAC VT and JTAC toolkits representing the first two of several planned
developments. The JTAC VT and JTAC toolkits at AFRL Mesa form the blueprint for an identical system at the Air Ground Operations School (AGOS) at Nellis AFB NV. Once in place, this second system will support AGOS training and serve as an additional JCAS R&D Testbed.

The effort to integrate more untethered (unencumbered by extraneous connections) toolkits and explore scalable IOS enhancements, as well as software and hardware options, will continue through the next spirals. JTAC TRS software is “shrink to fit” scalable to reduce system size requirements, and spiral three will target a deployable Garrison/Mobile partial-visual system for ASOS and STS units at home base or in the field. Spiral four is slated to meet immediate mission rehearsal needs, and the JTAC TRS software will drive a Helmet Mounted Display (HMD) mated with a Tactical Laptop.

In addition to serving as a networked platform during real-time large force DMO events, the JTAC TRS is augmented by the physics-based Next Generation Threat System (NGTS) to also enable realistic stand-alone training. Warfighters on the IOS can influence JTAC learning by processing and servicing doctrinally sound artillery Call-For-Fire (to include target marking and Suppression of Enemy Air Defense), requests for JCAS, fighter check-in, and 9-lines. The IOS operator can also inject NGTS constructive Blue and Red forces such as combat aircraft, ground forces, and surface-to-air threats, through the GOTS software developed at AFRL Mesa.

With incomparable ground-based training capability, JTACs can employ their Battlefield Air Operations (BAO) or TACP Close Air Support System (TACP CASS) toolkits in the fully immersive high fidelity 360 x 180 degree field of view dome or the semi-immersive deployable JTAC VT follow-on systems. A combination of untethered actual or emulated BAO or TACP CASS equipment enables warfighters to employ encrypted radio communications (AN/PRC-117F & 148), binocular visual acquisition (M-22), Laser Range Finder (MK VII), Global Positioning System (PSN-11 or 13), and Tactical Laptops.

On a broader scale, the JTAC TRS will integrate with the Joint Theatre Air Ground Simulator System (JTAGSS), the DMO-capable Joint Command and Control (C2) component, to “plug into” critical chain of command assets for on-demand realistic JTAC training. During JTAGSS development, embedded intelligent agents, voice-to-voice, and network system architecture technologies will facilitate training and rehearsal for all ASOC, DASC, TACP, Fire Support Element, and C2 battle staff warfighters.

The intricacies of the JTAC TRS and JTAGSS programs require an overarching SPO-level champion, and ASOS and STS customers plan to fund these programs to deliver unprecedented training capability for the JTAC, ASOC, and DASC warfighter. As the R&D engine for Combat Air Force (CAF) mission needs, AFRL Mesa is raising expectations for USAF and sister-Service warfighters while proving the next generation in readiness training capabilities will be ready for tactical employment, on time and on target.
Training Research: Objective and Subjective Measures of Performance

Two USAF Weapons School (USAFWS) squadrons took a week out of their live-fly Weapons Instructor Course (WIC) at Nellis AFB to immerse their students in high-fidelity multi-bogey, multi-group DMO training research scenarios at AFRL Mesa. Nine Air Battle Manager (ABM) instructors from the 8th Weapons Squadron (WPS) brought six WIC Class 05B students to support 10 F-16 instructor pilots from the 16th WPS and their 10 WIC Class 05B students for the 5-ride DMO syllabus designed to support USAFWS requirements and several AFRL Mesa training research programs. The close relationship with the USAFWS ensures leading-edge R&D is ready to provide training technologies and methods to improve the CAF’s wartime capabilities as weapons, platforms, and tactics change to meet evolving threats.

USAFWS instructors have also helped AFRL Mesa scientists and SMEs refine the Performance Evaluation Tracking System (PETS) to support objective in-depth analysis for archival studies and provide immediate mission debrief tools. PETS software pulls up to 1.8 million datapoints per minute from the F-16 Multi-Task Trainer four-ship networked to the Weapons Control Station, parsing the data into cogent outputs derived from numerous variables. The majority of these variables are used for statistical analysis, including key information warfighters need during debriefings, such as 3-dimensional aircraft position, acceleration, and velocity, positions relative to other aircraft, flight communications, and missile shot parameters. Blue and Red Air shot summaries, key to individual and team assessment, go deeper into each aircraft’s entity state at missile launch.

AFRL Mesa SMEs provide subjective assessments while accompanying each USAFWS team during flight briefs, missions, and debriefs. SMEs also use an electronic tablet with the Mobile Operational Measurement System (MOMS) software to make inputs based on the flight’s objectives for the period, their performance during mission execution, and their assessment of mission effectiveness during debriefs. MOMS and PETS tools ensure AFRL Mesa scientists have robust objective and subjective measures of performance as solid foundations for peer-reviewed technical reports and presentations to various research symposia and conference venues.

Owning Research: Objective and Subjective Measures of Performance

Lt Col “Simple” Symons describes how SMEs use MOMS to collect subjective data to three USAF Scientific Advisory Board members, (from left) Maj Gen George Harrison (USAF-retired), Dr. Peter Worch, and Dr. Mica Endsley, and Dr. Wink Bennett, who leads the AFRL Mesa research team.

Air Commodore Bob McAlpine, RAF Strike Command Ops Training, discusses the value of AFRL Mesa’s DMO research with pilots from Cannon AFB NM, the 524 FS “Hounds of Heaven,” and Wing Commander Mike Dobson, the UK’s lead for distributed simulation.

The Division’s Air and Space Operations Center (AOC) training research team delivered a performance measurement tool for use by the 505th Command and Control Wing instructors during the 2005 Blue Flag exercise at Nellis AFB. Evaluators used the tool to make quantitative assessment how personnel assigned to the Dynamic Targeting Cell performed their mission during intense operations. The AOC researchers validated human performance metrics and received positive feedback on usability of tool from the C2 experts.

The Division recently consolidated its Joint Worldwide Intelligence Communications System (JWICS) interconnectivity with the Secure Internet Protocol Router Network (SIPRNet) circuit at AFRL Mesa. Via Tactical Local Area Network Encryptor systems, JWICS via SIPRNet enables further progress of AFMC’s Sensitive Compartmented Information Network (SCINet) Consolidation Project. This fusion reduced AFMC’s annual line leasing costs by more than $15K and provides scientists and engineers classified networking access at a higher speed.
TARGETS OF OPPORTUNITY

Using Director’s Fund assets in a special program, the Division completed a key milestone test of LVC integration using the Joint Tactical Information Distribution System (Link-16) at AFRL Mesa. A Link-16 picture from a Joint Range Extension was converted from J-series messages to the Distributed Interactive Simulation protocol and fed into a cockpit loaded with the Common Configuration Implementation Program Operational Flight Program software. The simulator displayed the Link-16 data on the cockpit Horizontal Situation Display and proved to be a significant first step in bringing a true LVC training transformation to the CAF, key to CSAF’s DMO vision. Next is a demonstration with a live F-16 and AFRL Mesa’s virtual 4-ship of Vipers in late 2005, with full integration and evaluation testing in early 2006.

The F-15 SPO has “seen the light” and supports final engineering to adopt AFRL Mesa’s Multi-Mode External Lighting System for Aircraft (M2ESA) for installation in all F-15C Eagles. M2ESA provides programmable NVIS-friendly, Federal Aviation Administration-compliant visible and near-IR emission for night training and operations with NVGs. Prototype M2ESA devices were installed and successfully demonstrated over a four-month period on two Eagles at Nellis AFB, but the system concept is applicable to many other aircraft types. M2ESA is an integrated self-contained solid-state system, with each device comprised of a visible light source, a near-IR emitter, and power regulation/voltage discrimination circuitry local to each existing navigation light fixture. The system is designed for rapid installation without requiring wiring changes to the aircraft.